



*Better Buildings Residential Network
Peer Exchange Call Series*

*Coming Soon: Innovations Heading to the Residential Efficiency
Market from the DOE Advanced Building Construction Initiative*

June 23, 2022

Agenda and Ground Rules

- Agenda Review and Ground Rules
- Opening Poll
- Residential Network Overview and Upcoming Call Schedule
- Featured Speakers
 - **Adam Hasz**, U.S. Department of Energy
 - **Lucas Toffoli**, RMI
 - **Diana Hun**, Oak Ridge National Laboratory
 - **Rob Vieira**, Florida Solar Energy Center
- Open Discussion
- Closing Poll and Announcements

Ground Rules:

1. **Sales of services and commercial messages are not appropriate** during Peer Exchange Calls.
2. Calls are a safe place for discussion; **please do not attribute information to individuals** on the call.

The views expressed by speakers are their own, and do not reflect those of the Dept. of Energy.

Better Buildings Residential Network

Join the Network

Member Benefits:

- Recognition in media, social media and publications
- Speaking opportunities
- Updates on latest trends
- Voluntary member initiatives
- One-on-One brainstorming conversations

Commitment:

- Members only need to provide *one number*: their organization's number of residential energy upgrades per year, or equivalent.

Upcoming Calls (2nd & 4th Thursdays):

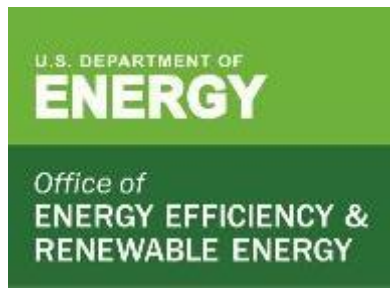
- 7/14: *What's Working in Local Residential Efficiency Policies?*
- 7/28: *Understanding Clean Heat Standards – What Is the Lay of the Land?*
- 8/11: *What Are Best Practices in Behavior Change for Energy Efficiency and Carbon Reduction*

Peer Exchange Call summaries are posted on the Better Buildings [website](#) a few weeks after the call

For more information or to join, for no cost, email bbresidentialnetwork@ee.doe.gov, or go to energy.gov/eere/bbrn & click Join



Adam Hasz
U.S. Department of Energy



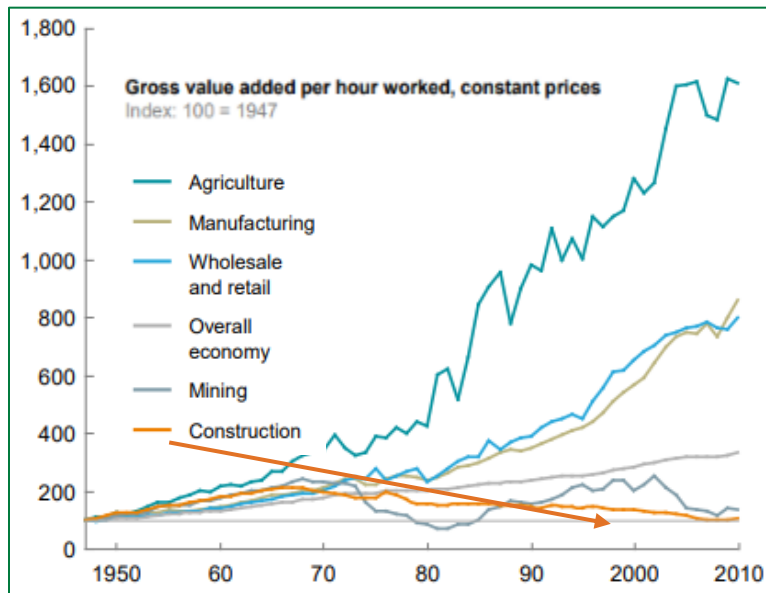
Advanced Building Construction (ABC) Initiative Overview

Adam Hasz
Building Technologies Office
U.S. Department of Energy



Building Construction and Renovation Faces Big Challenges

U.S. labor productivity in construction has declined since 1968



<https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/improving-construction-productivity>

Global building stock expected to more than double in area by 2060



2018 Global Status Report. United Nations Environment Programme. International Energy Agency for the Global Alliance for Building and Construction (GlobalABC)

US annual retrofits fall far short in quantity & depth to meet carbon goals

- ✓ Only about **2 percent of commercial building space** and **less than 1 percent of homes** undergo energy improvements each year
- ✓ Improvements typically just **scratch the surface with savings** rarely surpassing 30 percent
- ✓ **Comprehensive upgrades don't appeal to consumers:** too costly compared to perceived value, too slow, with inconsistent performance

EIA CBECS 2012 and RECS 2015; ACEEE 2017; Regulatory Assistance Project 2011

ABC: Industrializing Construction to Decarbonize Buildings

DOE's Advanced Building Construction (ABC) Initiative is focused on **accelerating the decarbonization of the U.S. buildings sector** through **industrialized construction** innovations that deliver **efficient, affordable, and appealing new buildings and retrofits**.

Development & Demonstration

Innovate & validate appealing solutions that can achieve carbon neutrality for common and high-impact building types.



Market Transformation

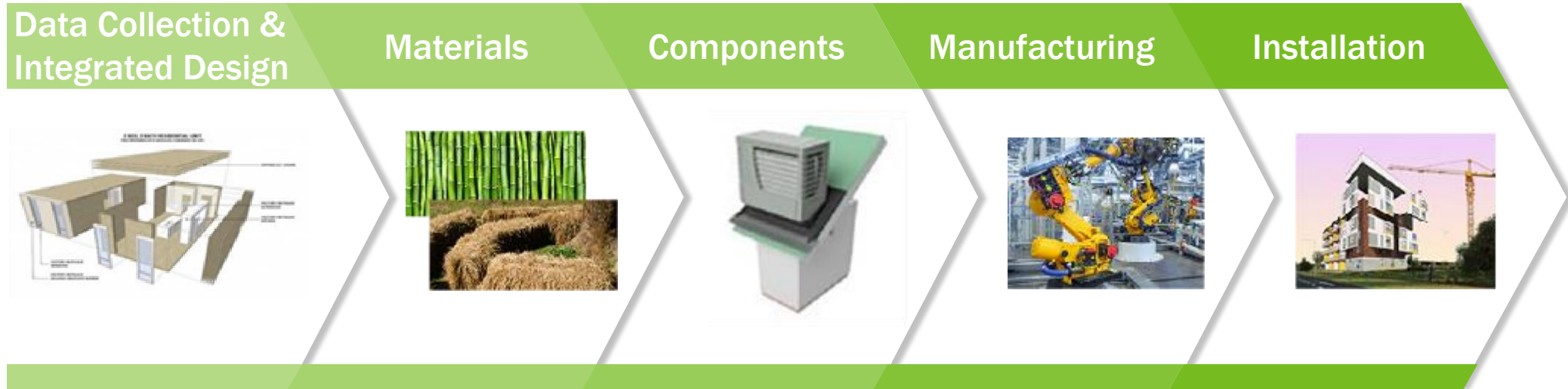
Use the ABC Collaborative to communicate consumer interests and inform product design; aggregate demand; reduce risks; and establish competitive business models.

ABC Initiative Investments Focus on Technologies, Manufacturing, & Markets

ABC Solutions Cut Across the Entire Supply Chain & Delivery

Advanced Building Construction solutions improve construction sector productivity and help the most difficult building types reach carbon neutrality.

Innovation Across the Supply Chain + Streamlined Delivery



Credits: Tocci (Data Collection & Integrated Design), Factory Zero (Components), Energiesprong (Installation)

DOE has made \$58m in investments in ABC technologies to date

Drone Mapping



Laser 3D Scanning



3D Printing &
New Methods of Fabrication



Offsite
construction



Mixed Reality



3D,4D, 5D
Modeling
Software



HVAC Pods



Unitized Wall Panel
Factory Assembly



Prefabricated
Wall Panels

Photo credit: Energiesprong



Demand is growing for ABC-type retrofits around the country

A graphic for the RetrofitNY Pledge. It features a background image of a city street with brick buildings. In the top left, there is a logo for 'NEW YORK STATE OF OPPORTUNITY' and 'RetrofitNY'. Below this, the text 'The RetrofitNY Pledge' is displayed, followed by a subtitle: 'A commitment to net-zero energy retrofits and increasing your building's value'. The main text reads '38 Building Owners' followed by a bulleted list: '• 9,604 buildings' and '• 404,775 units'.

NEW YORK
STATE OF OPPORTUNITY | RetrofitNY

The RetrofitNY Pledge
A commitment to net-zero energy retrofits
and increasing your building's value

38 Building Owners

- 9,604 buildings
- 404,775 units

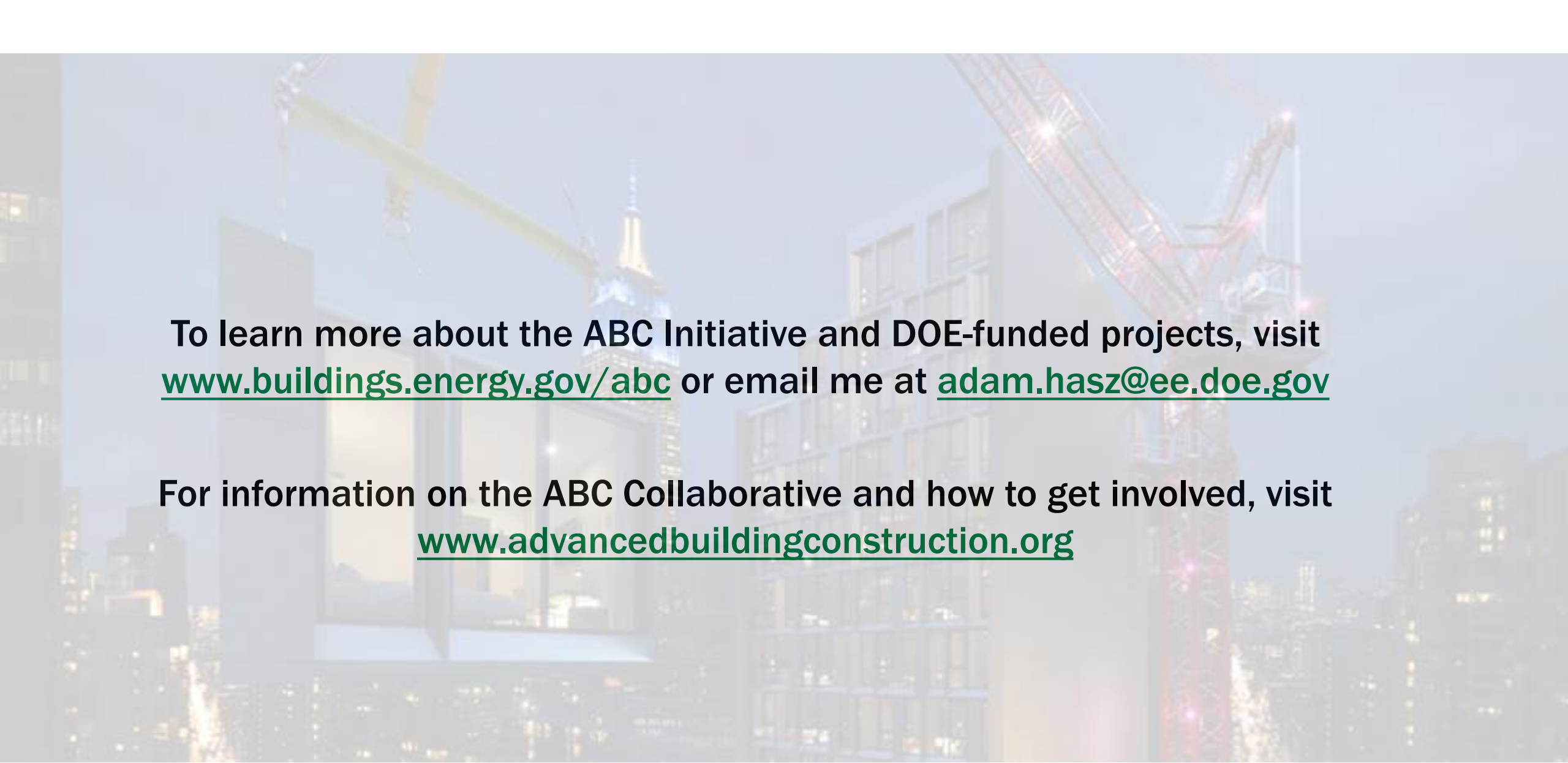
A graphic for 'THE REALIZE-CA BUILDING OWNER PLEDGE'. The top half features a photograph of a modern building's exterior with a white slatted fence and a person pushing a child on a scooter. Below the photo, the title 'THE REALIZE-CA BUILDING OWNER PLEDGE' is written in white on a blue background. Underneath, a subtitle reads: 'A commitment and call to action to support California's affordable housing owners and developers in decarbonizing their portfolios.'

THE REALIZE-CA BUILDING OWNER PLEDGE

A commitment and call to action to support California's affordable housing owners and developers in decarbonizing their portfolios.

35,598 units committed, more on the way

- 1000+ retrofit challenge in MA
- Interest from PHAs, including NYCHA



To learn more about the ABC Initiative and DOE-funded projects, visit www.buildings.energy.gov/abc or email me at adam.hasz@ee.doe.gov

For information on the ABC Collaborative and how to get involved, visit www.advancedbuildingconstruction.org




Lucas Toffoli
RMI

ADVANCED BUILDING CONSTRUCTION COLLABORATIVE


Presentation to Better Buildings Residential Network

23 June 2022



Our goal: to decarbonize the US building stock while improving resilience, affordability, and equity.

kolderal/Getty Images



Our hypothesis: by modernizing the construction industry and using more holistic definitions of quality and value, we can leapfrog the anemic pace at which decarbonization strategies are adopted by the mainstream buildings sector.

Mariko Reed / Onion Flats

Our answer:

Advanced Building Construction (ABC)

In short, ABC refers to retrofit and new construction solutions that combine:

**Energy-efficient
building decarbonization**

+

**Scalable, streamlined
industrialized construction approaches**

Deep energy efficiency has **substantial co-benefits**.



Reduced **maintenance**



Increased thermal and acoustic **comfort**



Improved indoor **air quality** and **health outcomes**



Resilience, including passive survivability



Reduced **emissions**



Electrical **grid stability**

Industrialized construction (IC) can help rapidly deploy energy-efficient, low-carbon buildings at scale.

- Only a small percentage of US construction uses IC approaches.
- Yet a large part of the ~\$700B US residential construction market could incorporate IC, which can enable higher performance, faster deployment, reduced schedule risk, enhanced QC, technology integration, and workforce benefits.

But real estate, construction, and the public sector must collaborate to achieve this!



Thought leadership helps guide stakeholders in the nascent ABC market.

The Collaborative is providing guidance for industry:

- ABC Market Insights Report
- Building Stock Characterization Studies (NREL)
- Industry Guidance Report – residential report expected this fall
- Topical briefs

COMING SOON!

RMI / Self Help Enterprises

ABC Industry Guidance Report: Residential



Residential real estate actors can get involved in growing ABC opportunities

Retrofit:

- MA 1,000-Apartment Challenge
- CA Building Owner Pledge
- NYSERDA RetrofitNY
- Future owner interest RfP

New construction:

- CA Bay Area small urban infill IC housing (pending)
- Milwaukee public-private IC housing partnership (pending)
- Future single-family homebuilder engagement
- Future multifamily IC design co-development

Residential Retrofit: REALIZE MA & CA

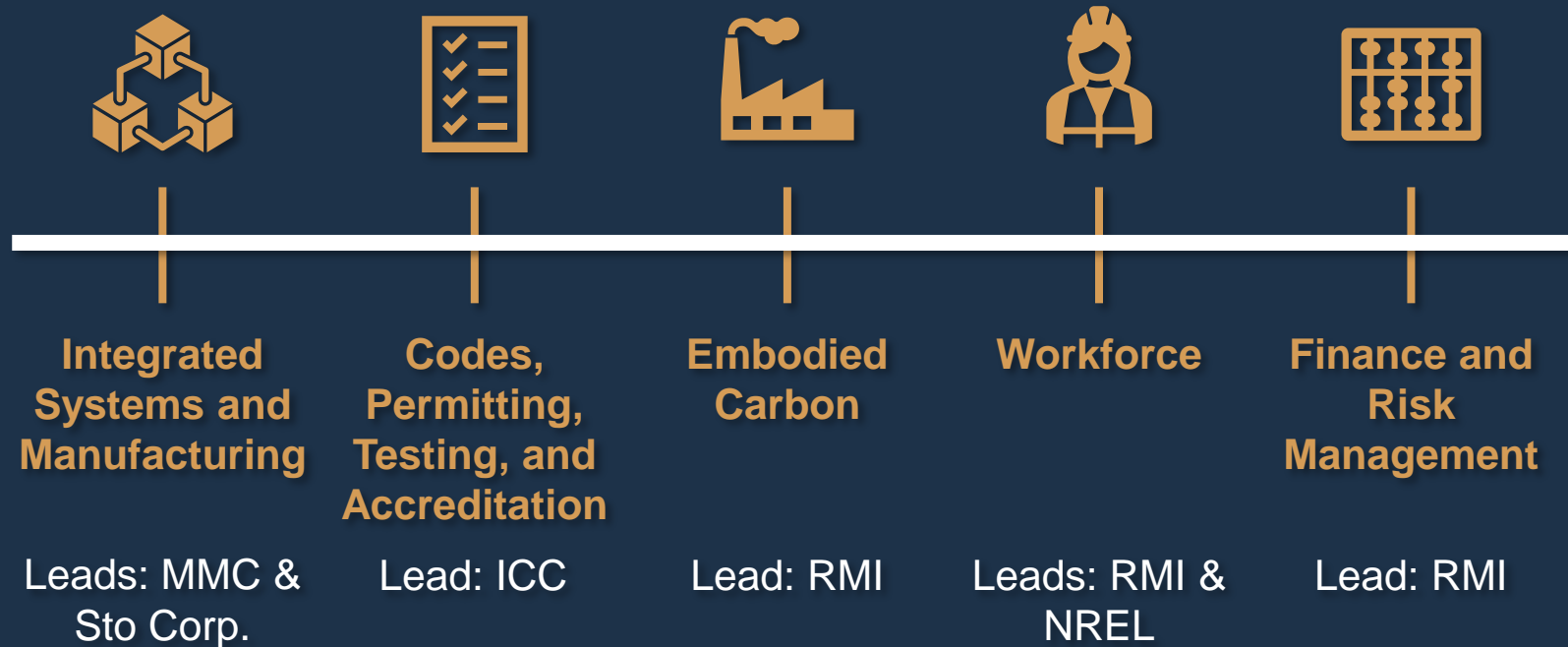


Residential New Construction: Proposed Bay Area EDA BBBRC Cluster

Interested organizations can also participate in the Collaborative's **convening activities**.

The Collaborative's active **Working Groups** offer participants ongoing **interactive programming on a range of topics**.

The ABC Initiative and ABC Collaborative also jointly organize **monthly Coffee Chats**



Note: Working Groups subject to change

Collaborative Network



Sheppard Group, LLC





ADVANCED BUILDING CONSTRUCTION

Collaborative

Thank You!

advancedbuildingconstruction.org/contact-us



Diana Hun
Oak Ridge National Laboratory

Integrated Retrofit Solutions for Residential and Commercial Buildings

Coming Soon: Innovations Heading to the Residential Efficiency Market from the
DOE Advanced Building Construction Initiative
June 13, 2022

ORNL: Diana Hun, Piljae Im, Nolan Hayes, Bryan Maldonado, Gunnar Johnson, Rui Zhang,
Mikael Salonvaara, Mahabir Bhandari
University of Tennessee: Uday Vaidya, Pritesh Yeole
Knoxville's Community Development Corporation: Brad Peters, Marisa Moazen

ORNL is managed by UT-Battelle, LLC for the US Department of Energy

Building Envelopes Group

35+ years leading development, integration, and deployment of building materials and systems

1

Envelope materials and systems that enable energy efficient, low-carbon, healthy, comfortable, and durable buildings

2

Advanced construction techniques that increase throughput and affordability

3

Free online tools that disseminate our findings

4

New construction and retrofits

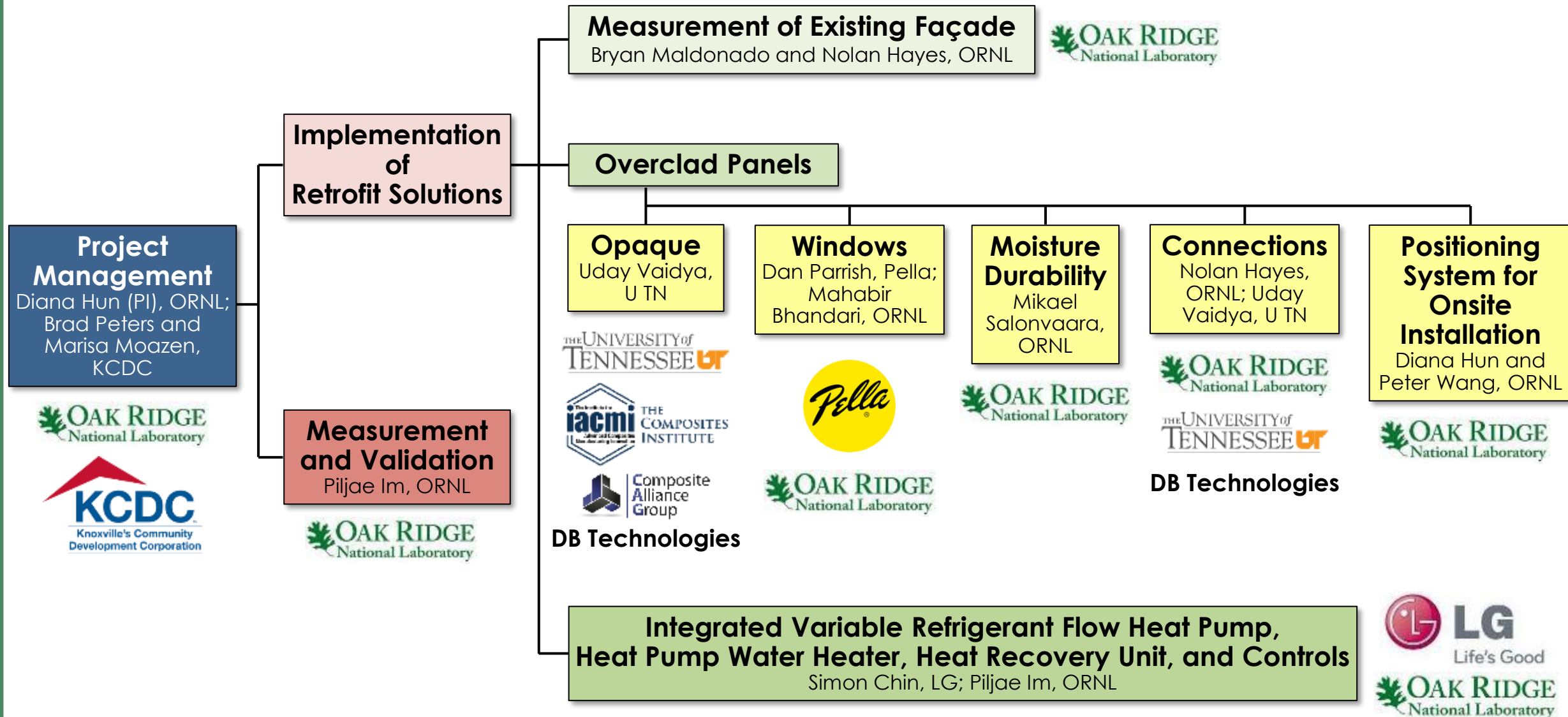
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Partnerships with academia and industry

Goals

- Develop and field validate integrated retrofit solutions
 - Decrease heating and cooling loads by $\geq 75\%$
 - Increase occupant comfort
 - Enhance building aesthetics
 - Reduce occupant disturbance and retrofit time
 - Replicable and scalable
 - Applicable to different building types and climate zones
- Set the path for underserved and other communities to attain high-quality, affordable, and energy-efficient building retrofits

Team, Roles, Technologies



Retrofit Sites



KCDC provides housing options in Knoxville and Knox County specifically designed to meet the needs of **families, seniors and disabled low-income residents**. KCDC Communities offer **high-quality, affordable housing** with resident amenities in a neighborhood setting.

Excellent opportunity to support the Justice 40 Initiative

Duplexes at Western Heights, Knoxville, TN

12 Duplexes

- Built in early 1940s
- ~20ft × ~60ft footprint
- No wall insulation
- Minimal attic insulation
- Load bearing masonry walls
- 15-year-old double pane windows w/o low-e coating
- Package terminal air conditioners (PTACs)
- 30-gal electric water heaters

Perfect opportunity to evaluate and optimize replicability, scalability, and cost reduction

Excellent Retrofit Opportunity

- Simple envelope
- Single story
- Load bearing masonry walls
- Retrofit 8 to 12 buildings



General Characteristics

- Built in 1967
- ~12,000 ft² of offices, meeting areas, and gym
- Load bearing masonry walls
- No wall insulation
- Single pane windows with aluminum frames
- PTAC units in offices and roof top unit (RTU) at meeting areas and gym
- Electric water heater

Great opportunity to test the retrofit technologies demonstrated at Western Heights

Excellent Retrofit Opportunity

- Start retrofit in ~2023
- Schedule allows completion of duplex retrofits and implementation of developed procedure on a more complex building type (e.g., non-planar façade, multizone commercial building with different space/occupancy types)
- Single story
- Load bearing masonry walls

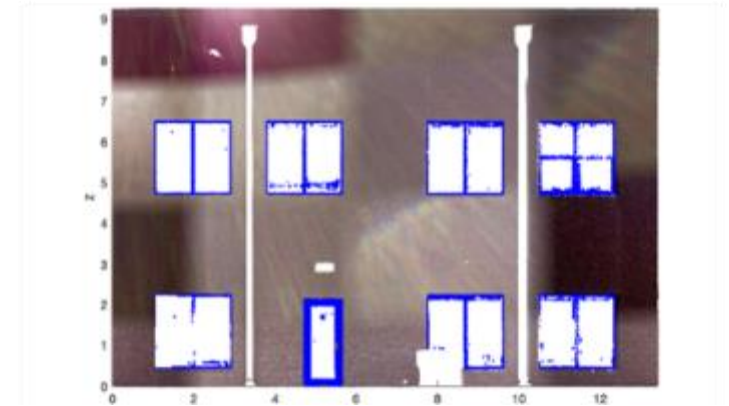


Retrofit Technologies

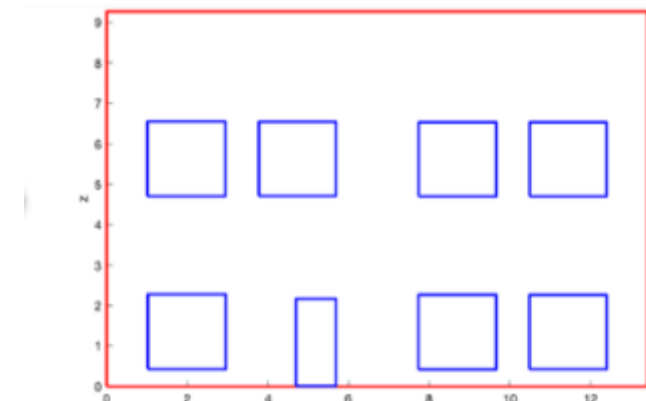
Cost-Effective Approach to Gather Measurements of Existing Facades

- **Reduce by $\geq 75\%$ amount of human effort** to manually survey building facades and clean point cloud data from 3D scanners
- Develop minimally-supervised machine learning algorithms
 - Supply dimensions for envelope perimeter, window and door openings, and other items, as well as their relative position
 - **1/8-inch accuracy**
- Status
 - Working proof of concept
 - Next steps: increase robustness and processing speed

Import point cloud data from 3D scanner and automatically identify openings

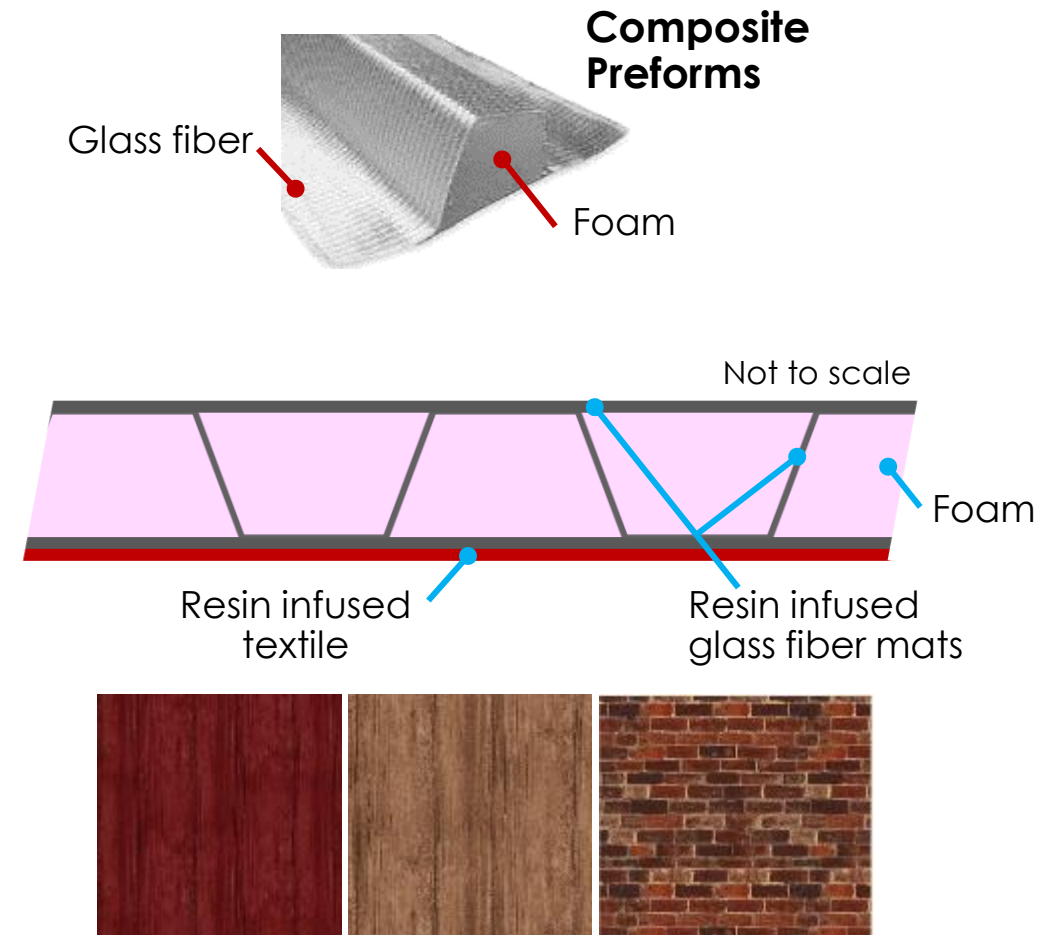


Automatically determine dimensions of façade and openings



Composite Overclad Panels

- Integrate thermal, air and water barriers, structural components, and cladding in a **thin and lightweight** profile
- **Scalable and cost-effective** vacuum assisted resin transfer molding process
- **Numerous cladding aesthetic options**
- **Meet wind and earthquake loads** by tailoring substructure layout, fiber reinforcement, resin type
- Drainage plane and vented cavity make retrofit design suitable for **different climate zones and building types**

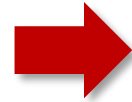
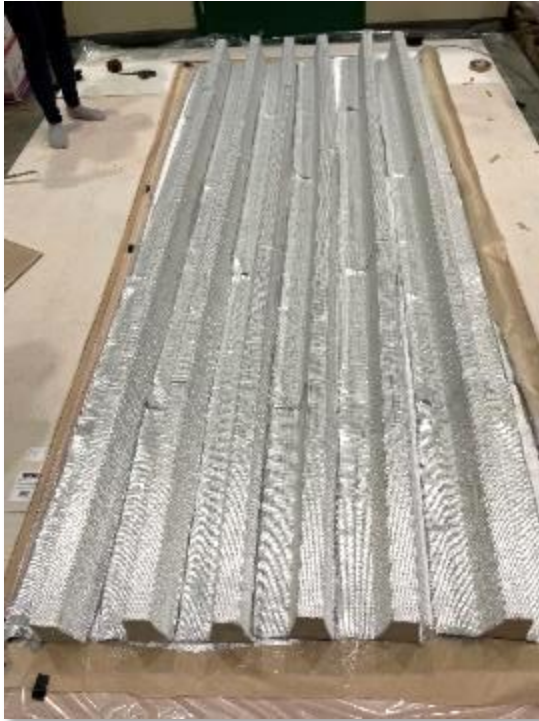


6-inch-thick panel

- ~R30
- ~4 lb/ft²
- Simple steps to tailor aesthetics and load capacity

Composite Overclad Panels Proof of Concept

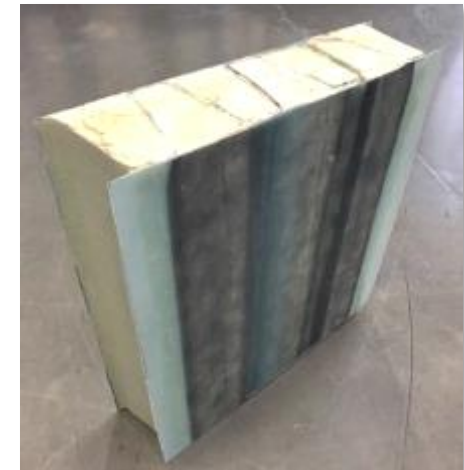
Composite preforms



Vacuum assisted resin transfer molding

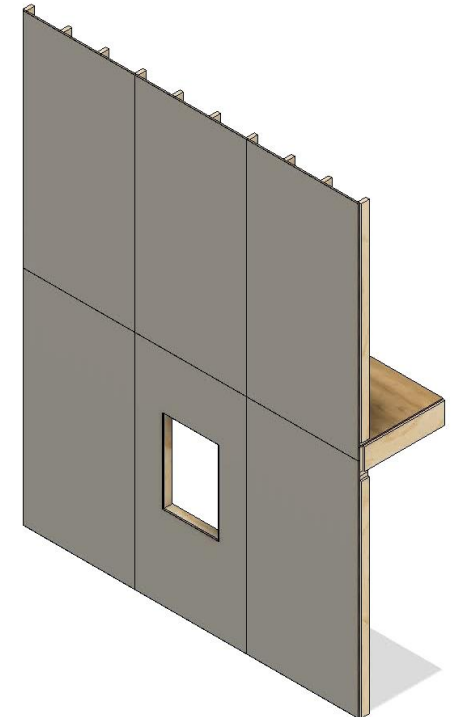
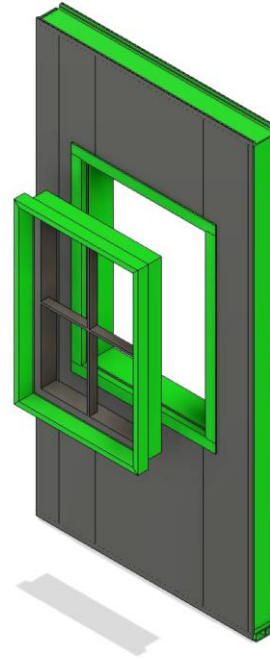
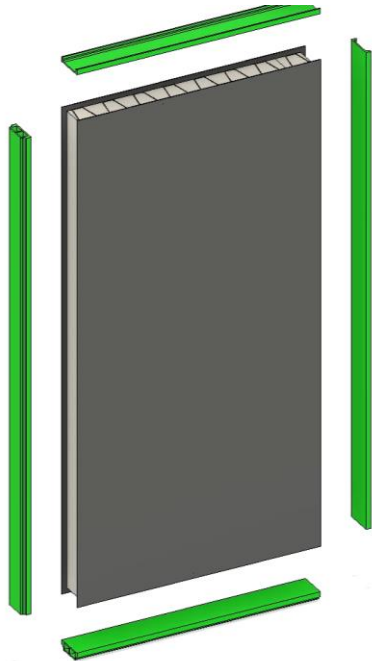
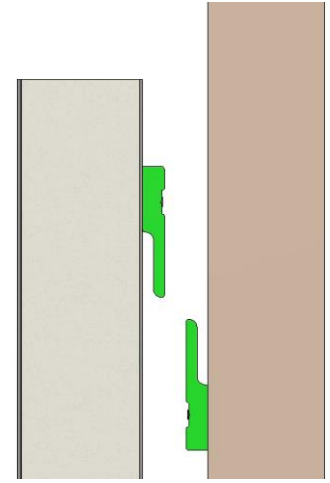
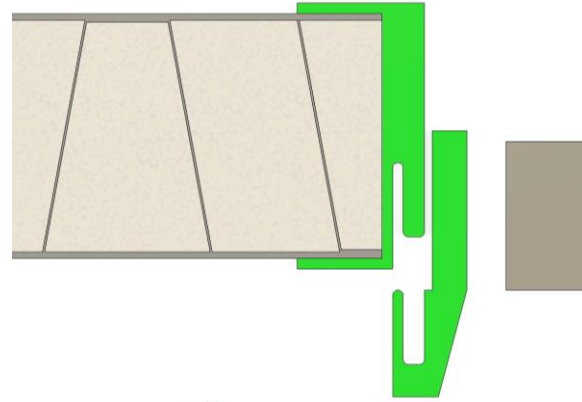
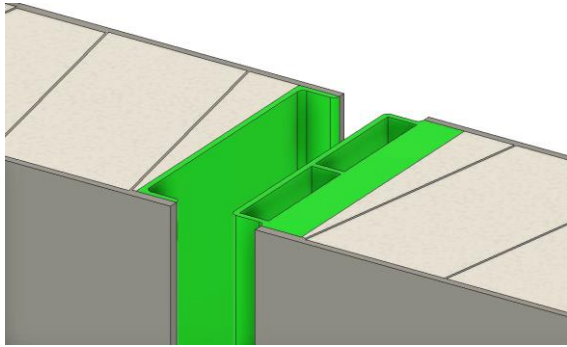


Assembly



Next steps: scale up, cost optimization,
embodied carbon reduction

Connections



Panel-to-panel

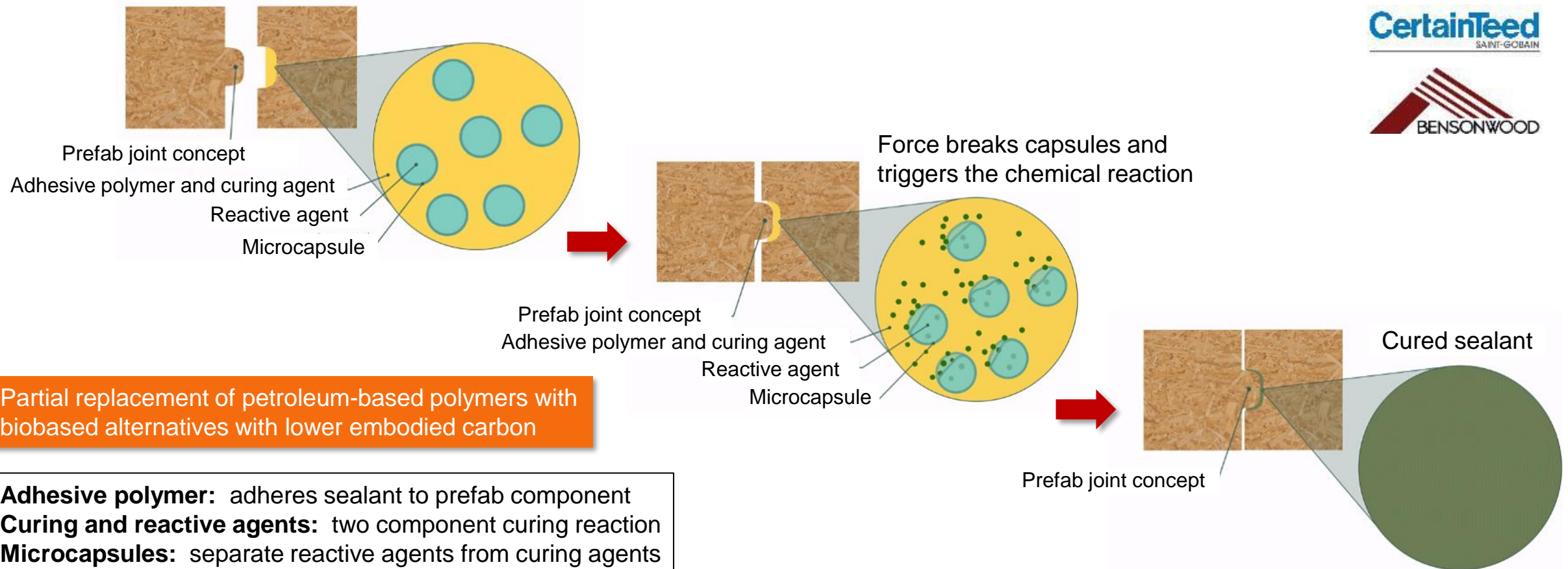
Panel-to-window

Panel-to-building

Preinstalled Sealant for Prefab Components

Low-carbon sealant that is

installed at prefab plant and pressure activated at jobsite



Real-Time Evaluator that Optimizes Overclad Panel Installation

- **Decrease installation time and cost by $\geq 25\%$**
- Autonomous robotic tracker collects positioning data of panels during installation
- Algorithms compare panel's real-time location to a digital twin with as-designed panel locations
- Real-time instructions to installation crew on how to improve positioning of panels and meet required tolerances

Digital twin with as-designed panel location



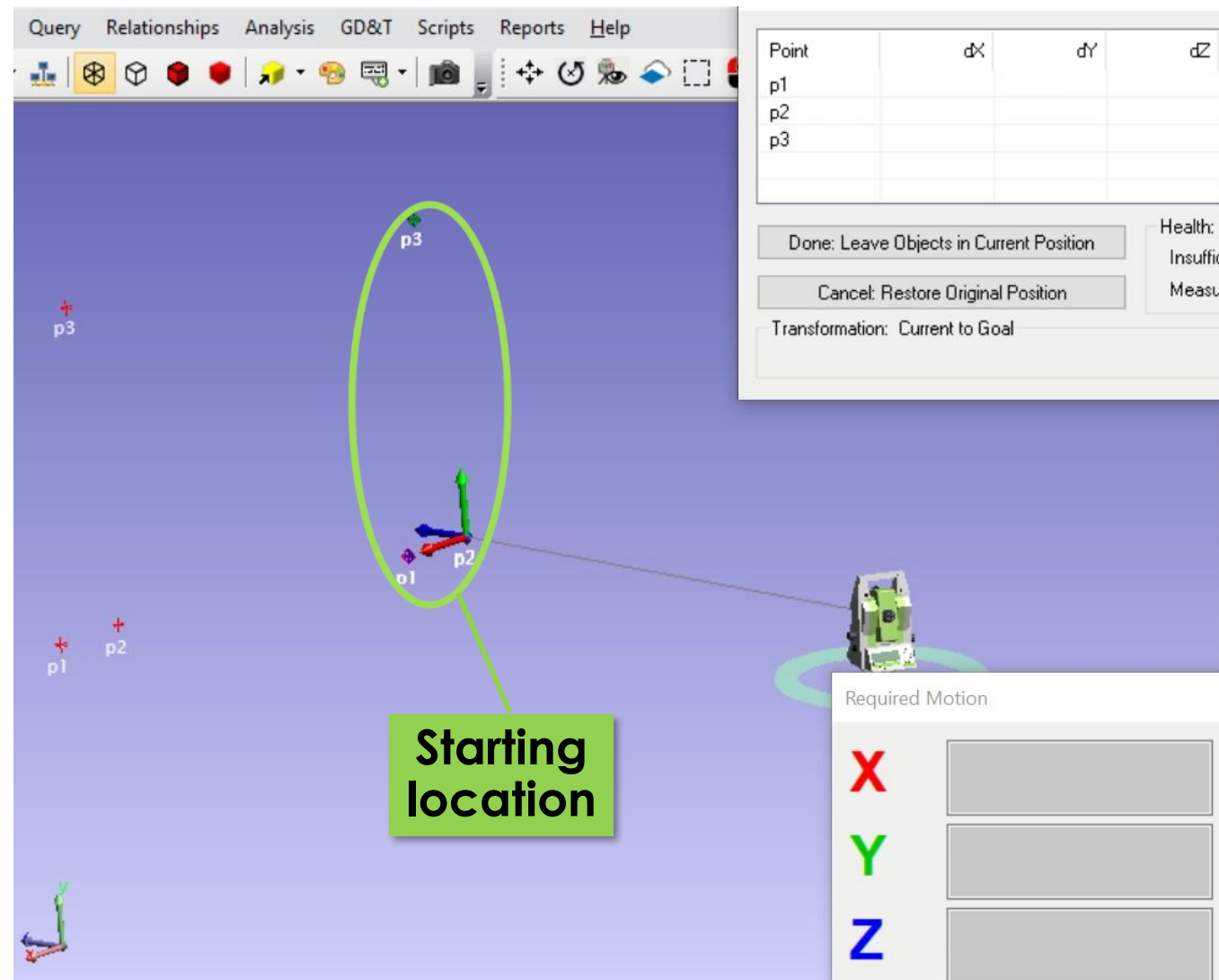
Real-time data collection and feedback to crane operator and installers that are setting the panels

Real-Time Evaluator Proof of Concept



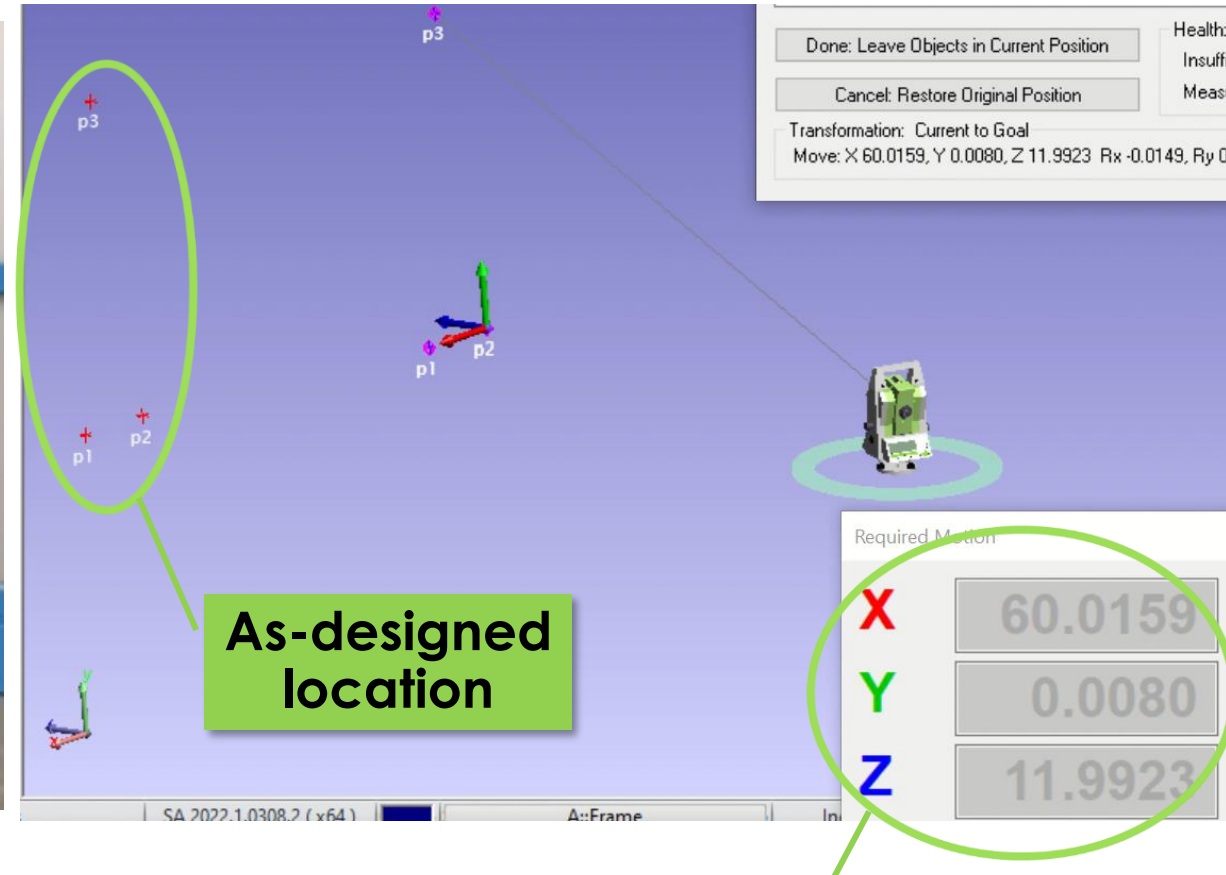
Targets

Autonomous robotic tracker



Starting location

Real-Time Evaluator Proof of Concept

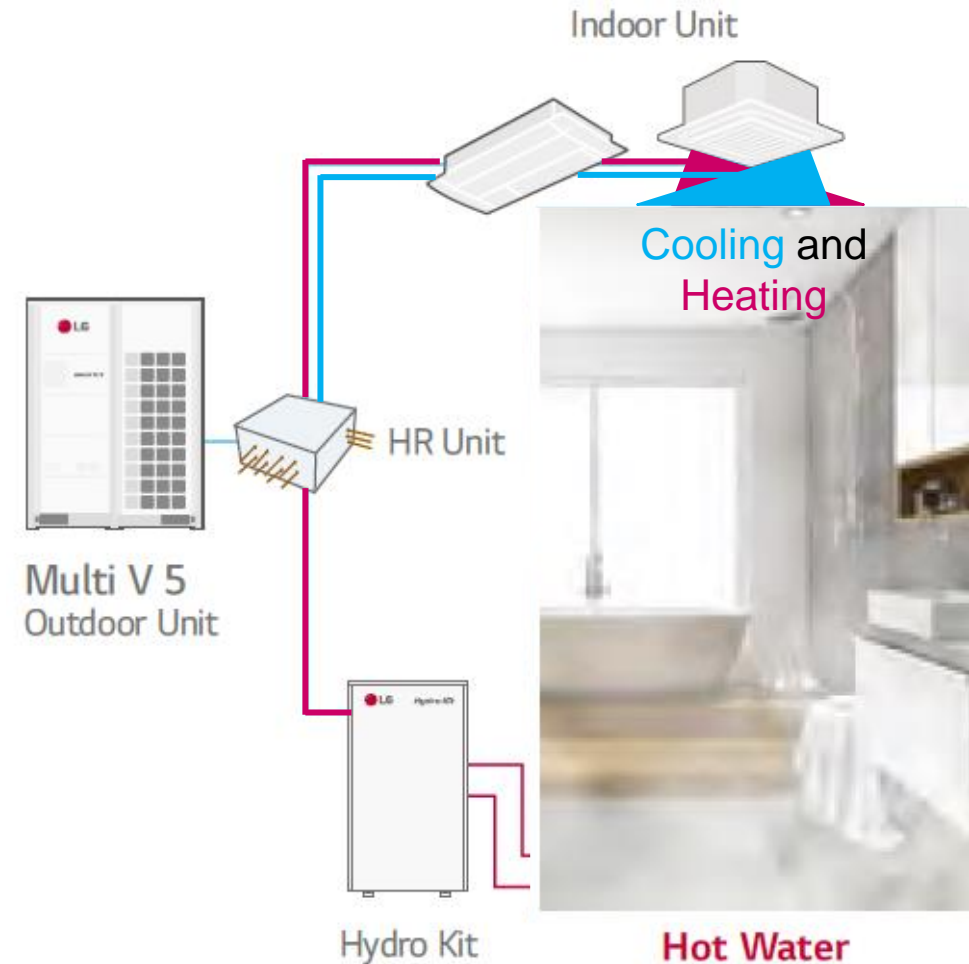


Next steps: increase processing speed, develop user-friendly interface and easy-to-install fixtures for targets

Difference between real time and as-designed location

Integrated Variable Refrigerant Flow (VRF) Heat Pump (HP), HP Water Heater, Heat Recovery Unit, and Controls

- State-of-the-art, off-the-shelf HVAC and water heater systems
- VRF HP can **reduce cooling by 30% and heating energy by 50%**
- **Maximize occupant comfort** by integrating VRF HP with heat recovery unit, smart controls that **adjust refrigerant and air flow** based on indoor and outdoor temperatures, and indoor RH
- **Increase energy savings** by integrating VRF HP and heat recovery unit with water heater

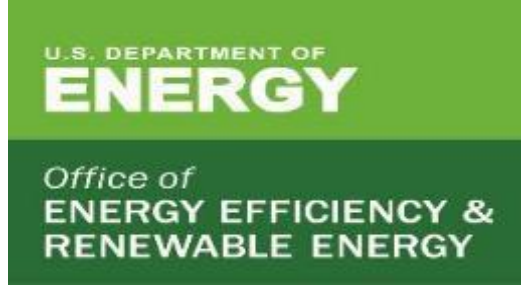


Questions?

Diana Hun, hunde@ornl.gov



Rob Vieira
Florida Solar Energy Center



PV-GEMS: Photovoltaic Powered, Grid Enhanced Mechanical Solution

Eric Martin, Principal Investigator

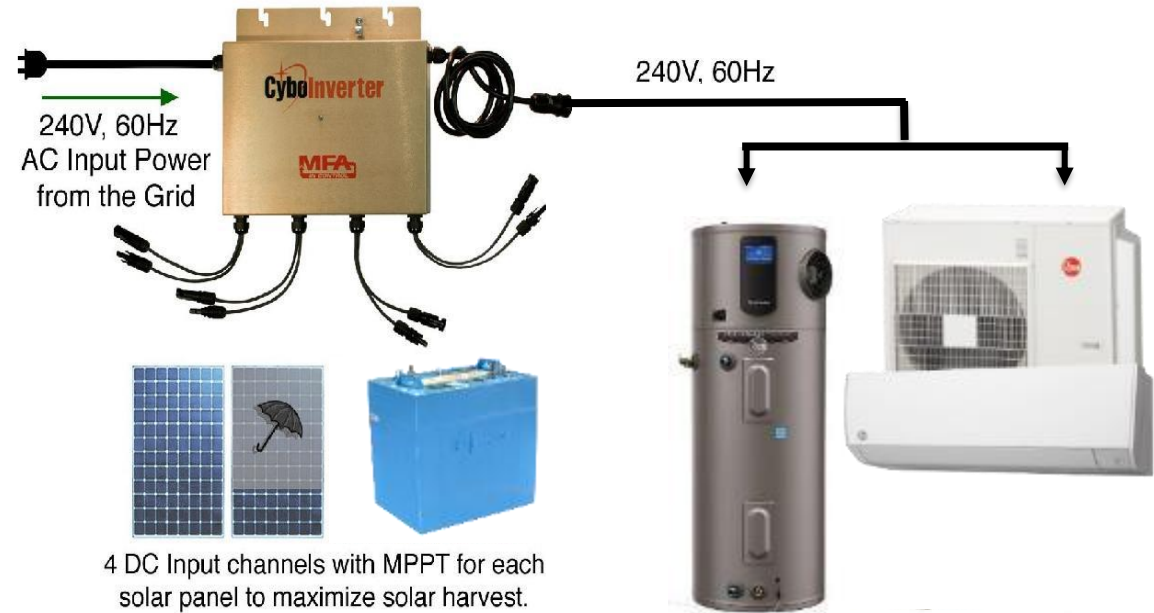
Presented by Rob Vieira, Director, Buildings Research Division

martin@fsec.ucf.edu, robin@fsec.ucf.edu



Primary Retrofit Approach - High efficiency space conditioning and water heating equipment enhancement

- Retrofit involves a heat pump water heater, and a heat pump for space heating and cooling.
- PV and Grid assisted micro-inverters enhance the resource-use efficiency of the components by minimizing grid energy inputs.
- No PV energy ever sent to grid – excess stored with batteries and used to power loads when sun is down.
- Many possible delivery mechanisms that minimize occupant disruption including pre-packaged “pod” assembled off-site.
- System designed to reduce energy use, demand, and carbon; provide renewable electrification; and enable elements of grid-interactivity and resiliency.



<https://www.youtube.com/watch?v=mRHLW0sD1go>

Phase 1 Achievements - Pilot Systems

16kBtu/h MSHP, 80 gal HPWH,
6 kWh storage

Building Science Lab

2.4kW PV (320W x 8)



Manufactured Housing Lab

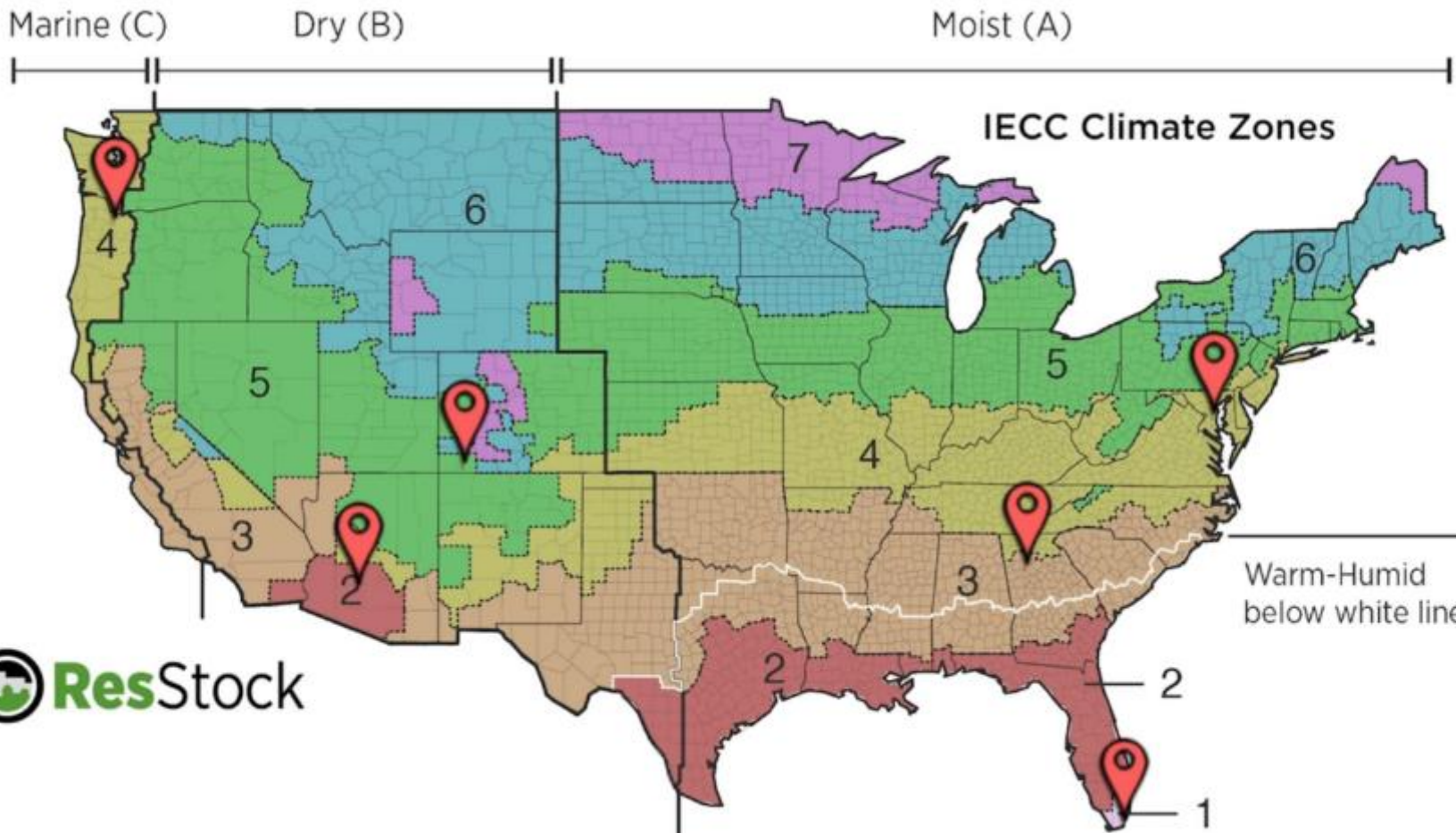
1.24kW PV (310W x 4)



12kBtu/h MSHP, 50 gal HPWH,
3 kWh storage



Savings Estimates - EnergyPlus Simulations Calibrated with Monitored Lab Data



Created multiple single-family home baselines for six cities representing CZ 1-5:

Vintage

- Pre-1990 (80s)
- Post-1990 (90s)

Central Heating System

- Electric resistance
- Heat pump
- Natural gas

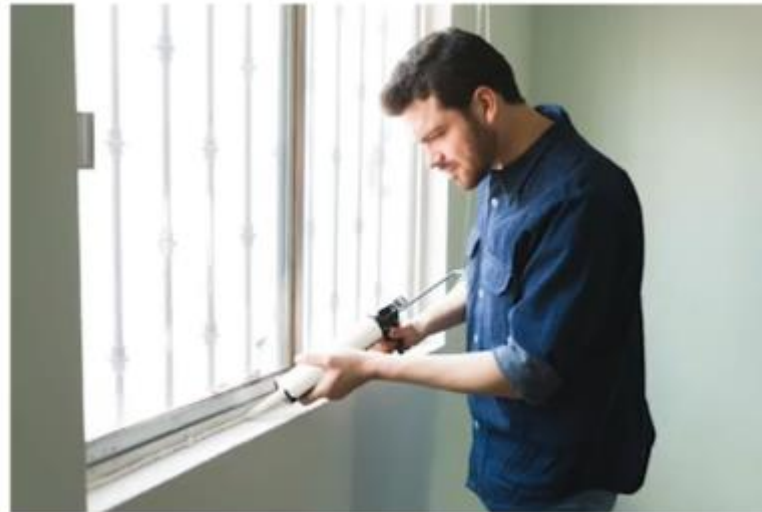
Retrofit Approach - Bundle with Shallow Retrofit Improvements

- Deploy with cost effective, minimally-disruptive retrofit measures that will improve control of airflow, pressures, and comfort while reducing heating and cooling energy use.

Duct Sealing



Envelope Sealing



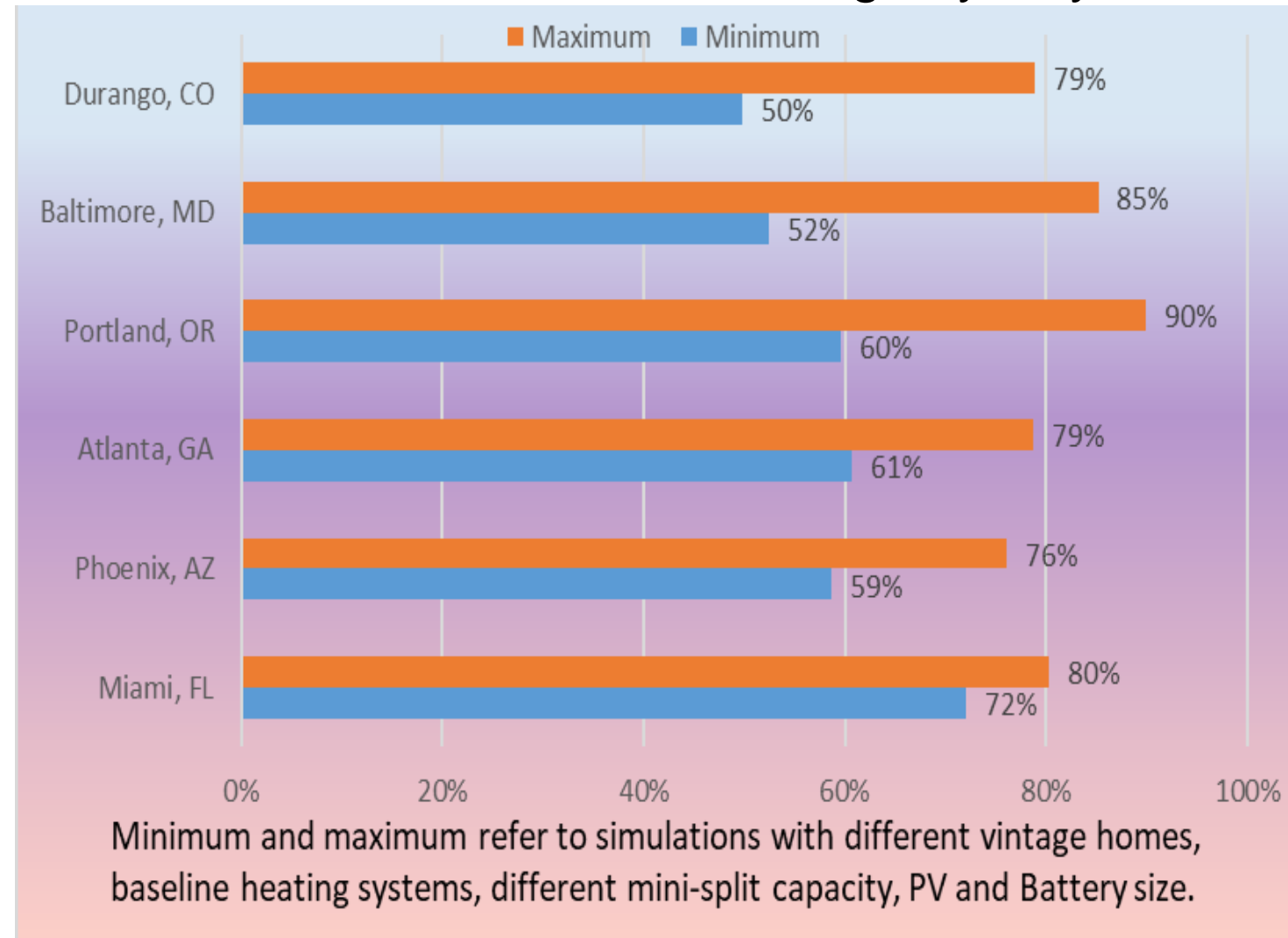
Ceiling Insulation



Savings Estimates – Summary of 150 EnergyPlus Simulations

- Savings from shallow retrofit range from 4%-18%.
- Total savings for HVACWH range from 50%-90%.
- At least 1 case in each climate >75% savings.
- **Higher % savings in newer homes, but greater kBtu/ft² savings in older homes.**
- Greater kBtu/ft² savings in heating dominated climates.

Annual HVACWH EUI Savings by City



Phase 2 Team



- Experience developing and commercializing buildings technologies.
- Experience validating new technologies in occupied buildings.
- Experience working with building industry to incorporate innovations.



E. Martin,
Proj. Mgmt.



C. Colon,
Tech. Mgmt.



R. Raustad,
Lab Eval.



C. Withers,
Demonstrations



D. Chasar,
Training



Manufacturer Partner



Recruitment Partner



Deployment Planning Partner

Phase 2 Proposed Work Plan – Laboratory Evaluation Task

Activity A – Validate PV-GEMS enhancements.

- 1 – Test updated micro-inverter enabling improved battery integration and resiliency mode.
- 2 – Test PV-GEMS option for central system replacement with centrally ducted heat pump.
- 3 – Enable HPWH advanced load up.



Building Science Lab



Inverter Driven Central Heat Pump

Activity B – Develop pre-packaged prototype.

- Use components from the Phase 1 MH Lab system.
- Includes design considerations for cold climates.



High Bay Lab



Commercial Shed

Activity C – Finalize field demo systems

- Develop design, specifications, and contractor scopes of work with assistance from local engineering firm.



Phase 2 Proposed Work Plan – Demonstration Task

- Each site will undergo an energy audit, and 8-12 months of pre- and post-retrofit monitoring.
- Local engineering firms utilized to review/adjust master specs for permitting.
- Local contractors utilized to perform shallow retrofits (focus on belly of manufactured homes) and furnish / install PV-GEMS components. Leverage network of “Rheem Pro Partners.”



Planned Demonstration Sites (12 Total*)

Climate Zone	Location	Community Name	Building Type	PV-GEMS Installation
5B, Cold/Dry	Durango, CO	Animas View	Manufactured Homes	Site Assembled
5A, Cold/Humid	Hudson, MA	Meadowbrook	Manufactured Homes	Site Assembled
2A, Hot/Humid	Pasadena, TX	Pasadena Trails	Manufactured Homes	Site Assembled
4C, Marine	Oregon	TBD	Manufactured Homes	Site Assembled
4A, Mixed/Humid	North Carolina	TBD	Single-Family Homes	Site Assembled
3A, Mixed/Humid	Georgia	TBD	Single-Family Homes	Pre-Packaged

*Two homes per location, all with 60 gal HPWH.
Ten systems with 1.5 ton MSHP supplements, 4 PV modules, 3kWh battery
Two systems with central system replacements, 4-8 PV modules, 3kWh bat.
Have spoken with Habitat affiliates doing retrofits, including HUD code.

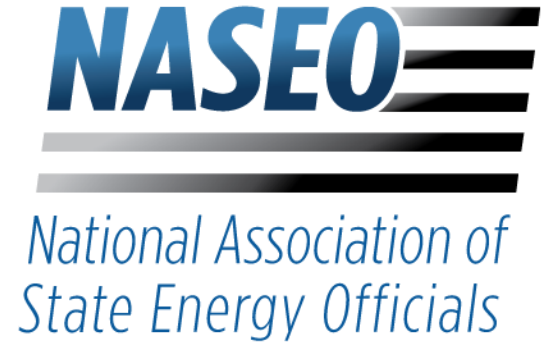
Phase 2 Proposed Work Plan – Manufacturing Task

- Investigate design and manufacturing of commercialized PV-GEMS systems.
- Focus Areas:
 - PV-GEMS system enclosure.
 - PV-GEMS system controller.
- Goal to develop functional prototypes.
- Investigation could reveal opportunity to commercialize part of the PV-GEMS system, or a related innovation.



Phase 2 Proposed Work Plan – Deployment Planning Task

- Task led by NASEO, who is already working with DOE BTO to identify policy considerations for successful ABC approaches in multifamily.
- Convene task force to develop technology transition plans for 1) manufactured housing and 2) single family attached/detached to bring commercialized product to market.
- Technology transition plans consider manufacturing, distribution/installation, marketing/sales, along with value to key stakeholders to leverage financing/incentives.
- Task force members include representatives from state and local government, regional efficiency organizations, financing institutions, utilities, energy and green bank programs, and energy efficiency programs.
- ROC USA and affiliates participate as community reps, Rheem participates as manufacturer rep, and WATSCO participates as distributor rep.



Phase 2 Proposed Work Plan – Training Task

- Online training geared towards eventual turn-key contractors furnishing and installing PV-GEMS.
- PV-GEMS is unique and cuts across traditional silos including HVAC, solar, electrical, structural, and plumbing.
- Installation curriculum to feature video content and simulated, interactive installation scenarios for virtual hands-on experience. Separate sales curriculum to feature PV-GEMS benefits / economics.
- Draft curriculum content outlined and vetted with Deployment Task Force, and beta tested with early adopter contractors identified by Rheem and WATSCO.



**FSEC Energy
Research Center**



**IST, School of Modeling
Simulation and Training**



PV-GEMS Summary

PV-GEMS retrofit approach achieves 75% HVACWH energy savings:

- Monitored savings of component limited prototype in central Florida exceeds 50% cooling season savings.
- Simulations predict 50%-90% savings in CZ 1-5 with at least one configuration exceeding 75% in every climate.

PV-GEMS retrofit approach overcomes some challenges with traditional deep energy retrofits:

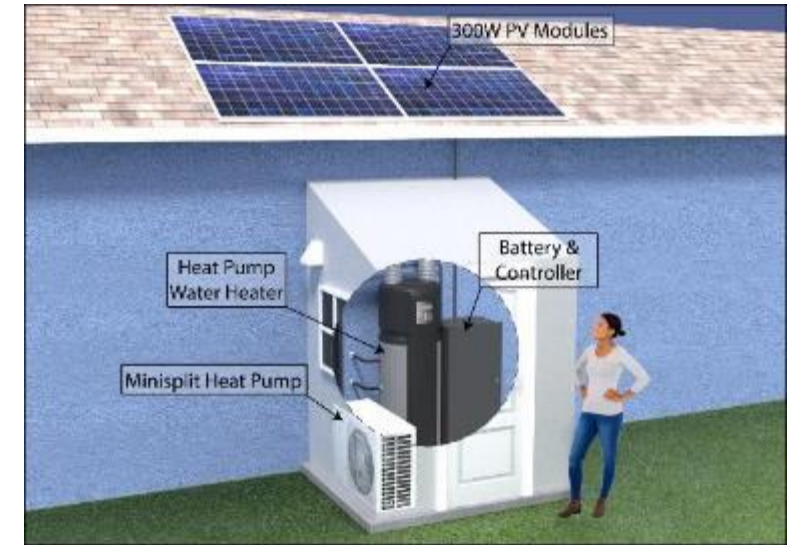
- Mechanical solution that integrates conventional high efficiency equipment in an innovative fashion, deployed alongside a shallow retrofit.
- Provides an effective retrofit that is installed with minimal disruption.

PV-GEMS retrofit approach is replicable and scalable:

- Core technology applicable to most single family homes.
- Commercialized product configurable to various needs/opportunities.

PV-GEMS retrofit approach delivers added value:

- Provides renewable electrification of space and water heating.
- Accommodates grid-interactive efficient building strategies.
- Enables elements of resiliency during grid outage.
- Phase 2 work plan considers energy equity and workforce development.





FSEC Energy Research Center

UNIVERSITY OF CENTRAL FLORIDA

Thank You

Rob Vieira
robin@fsec.ucf.edu

Link to PV-GEMS Video
<https://vimeo.com/655024096>

Explore the Residential Program Solution Center

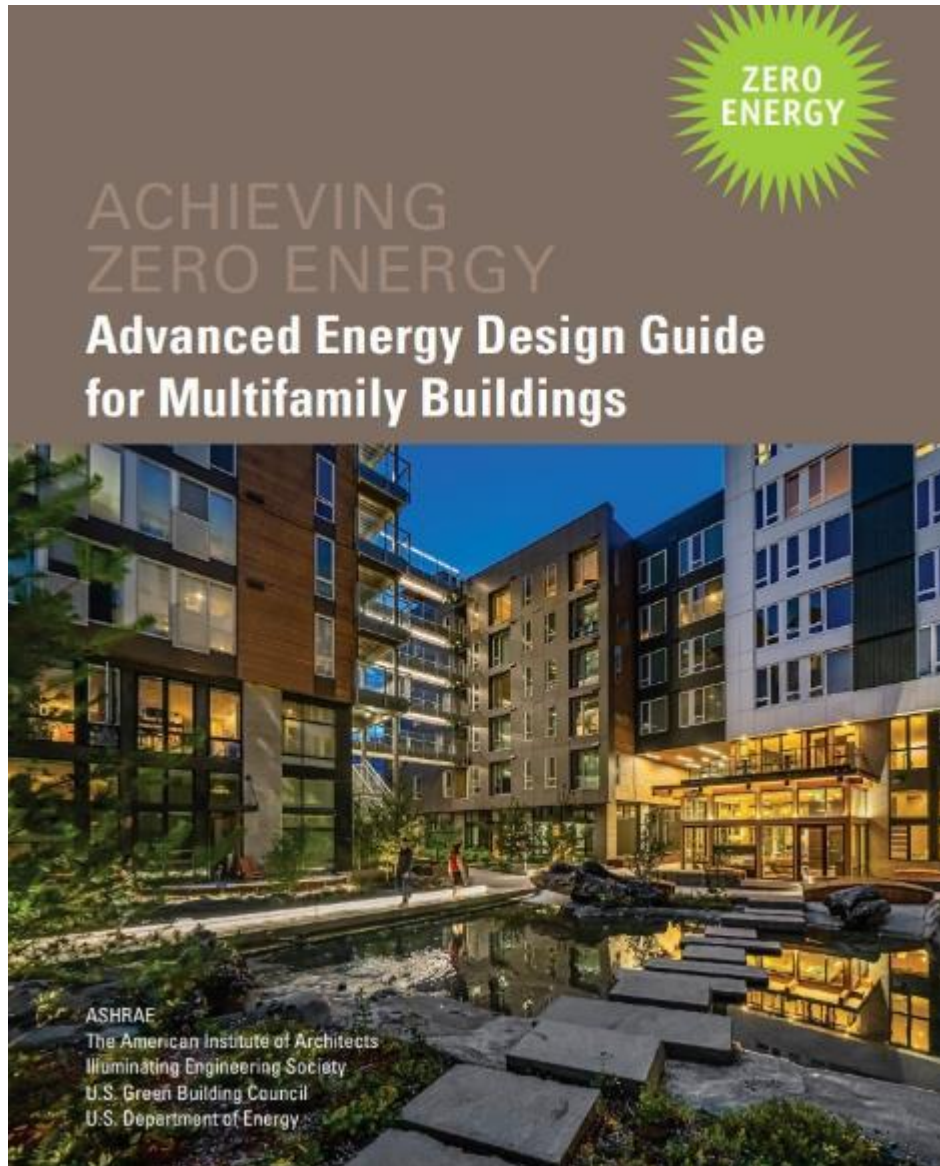
Resources to help improve your program and reach energy efficiency targets:

- [Handbooks](#) - explain *why* and *how* to implement specific stages of a program.
- [Quick Answers](#) - provide answers and resources for common questions.
- [Proven Practices](#) posts - include lessons learned, examples, and helpful tips from successful programs.
- [Technology Solutions](#) **NEW!** - present resources on advanced technologies, **HVAC & Heat Pump Water Heaters**, including installation guidance, marketing strategies, & potential savings.
- [Health + Home Performance Infographic](#) **NEW!** – spark homeowner conversations.



<https://rpssc.energy.gov>

Zero Energy Advanced Energy Design Guide for Multifamily Buildings



This Guide demonstrates that zero energy multifamily buildings are attainable and provides design teams with strategies for achieving energy savings goals that are financially feasible, operationally workable, and readily achievable.

The Guide offers direction for designing and constructing zero energy multifamily buildings in all climate zones through recommendations, strategies, and solution packages.

Now available for free download through ASHRAE
<https://www.ashrae.org/technical-resources/aedgs/zero-energy-aedg-free-download>

New Health + Home Performance Infographic



Do You Have a “Healthy Home?”

A qualified contractor can help you assess and address indoor air quality, improve your comfort, and cut your utility bills.

Answers to a few basic questions can help you get started:

- **How old are your heating and cooling systems?**
Ensuring your system is updated and well maintained can save money and improve health and comfort.
- **Is your home insulated?**
Properly installed insulation in your walls and attic, at levels recommended for your home's climate, will cut bills, and improve comfort.
- **Have you ever noticed mold in your home?**
Visible mold likely means humidity levels need to be better addressed or indicates a potential leak or water damage.
- **Are your windows caulked and doors weather-stripped?**
These relatively simple fixes reduce air leaks and help maintain indoor temperature levels.
- **Are your appliances ENERGY STAR® rated?**
ENERGY STAR appliances are energy efficient and help you save money.
- **Do you know if your home's heating and cooling systems include proper levels of ventilation?**
Effective ventilation is important for both health and safety. Ventilation, along with frequently replaced air filters, can help make sure your home is bringing in fresh air as needed, and keep out pollutants when outdoor air quality is poor due to ozone, fire, or other factors.

GET started

FIND A QUALIFIED CONTRACTOR:

- Home Performance with ENERGY STAR® at ENERGYSTAR.gov/HomePerformance
- Building Performance Institute at bpi.org/locator-tool

U.S. DEPARTMENT OF ENERGY | OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY
BUILDING TECHNOLOGIES OFFICE

DOE/EE-2349

HOME PERFORMANCE WITH ENERGY STAR

DOE’s new Health + Home Performance Infographic reveals the link between efficiency and health – something everyone cares about. Efficiency programs and contractors can use the question-and-answer format to discover a homeowner’s needs.

The infographic is ideal for the “kitchen table” conversations where people decide what to do – and who they want to do it. It also has links for homeowners to find a qualified contractor if they do not already have one.

[Download](#) this infographic from DOE’s Better Buildings Residential Network.

Thank You!

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Please send any follow-up questions
or future call topic ideas to:
bbresidentialnetwork@ee.doe.gov